Group B
session 3: Human Resources Management

Session will start at 15:10 CET

Lucas Stephane (IFE)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement nº 847626.

Group B
Session 3 - Human Resources Management

SHARE
A roadmap for research in Decommissioning

Human resources management			
Dec. 2nd	International initiatives		
	15:00	3A	Presentation of IDN IAEA Wiki by Patrick O'Sullivan *(10min)*
Link teams Dec 2d Group B	15:10	3C	Presentation of EU Project ELINDER by Pierre Kockerols, JRC *(10min)*
	15:20	3E	Presentation of ENEN by Joerg Starflinger *(10min)*
	15:30	3D	Presentation of NEA-NEST initiative by Antonella DI TRAPANI, NEA *(10min)*
	15:40	4E	Presentation of first achievements from SHARE in this area + introduction to post it session, by Reika Szoke, IFE
	16–16:50: Post it session by sub-thematic area		
	Link MURAL 32	32	General education for Decommissioning
Dec. 3d	**9:00–12:00: Post it session by sub-thematic area**		
Link teams Dec 3d Group B	Link MURAL 31	31	Methods and software tools for knowledge management (e.g. competence preservation)
	Link MURAL 33	33	Methodologies and tools for task specific training
	Link MURAL 30	30	Organisation models (staff and resources)

IAEA
International Atomic Energy Agency
Atoms for Peace and Development

IAEA Nuclear Wiki

Patrick O'Sullivan

International Atomic Energy Agency

2 December 2020

Horizon 2020 SHARE-Decommissioning Workshop
1-3 December 2020 *[Virtual]*

IAEA Nuclear Wiki

IAEA

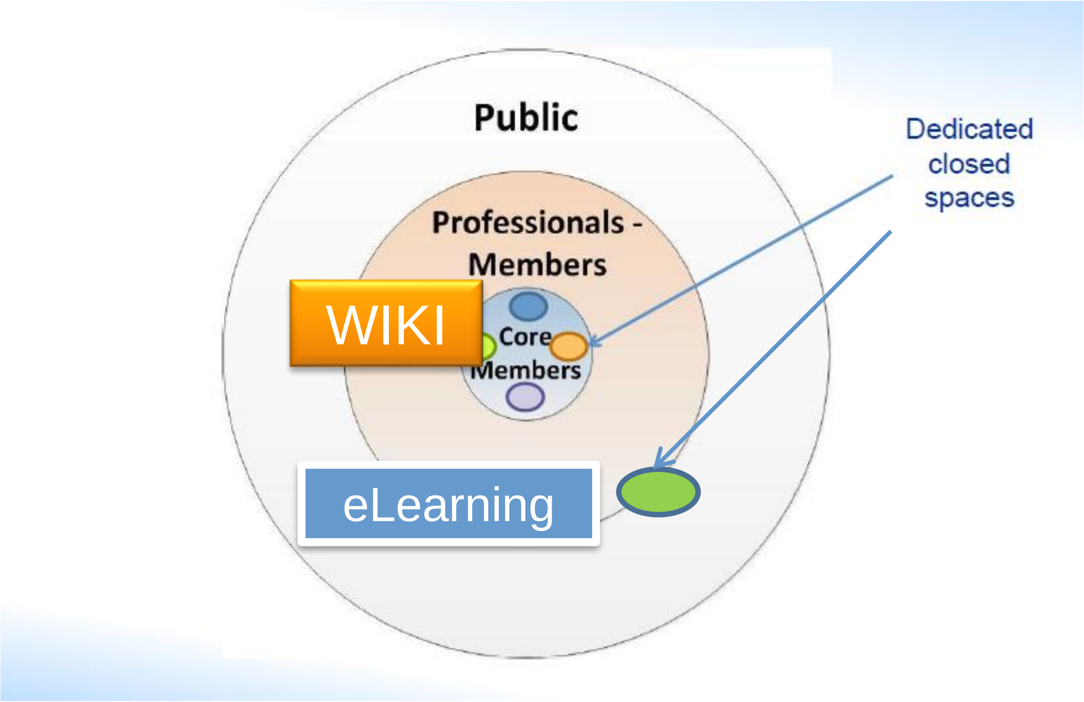
60 Years

Atoms for Peace and Development

Plan of Presentation

- IAEA Electronic Tools
- Nuclear Wiki
- Example Articles

Web Portal, Networks and e-Tools



For Members: Webinars, Live Streaming, Advanced review of documents, ….

IAEA Supported Tools

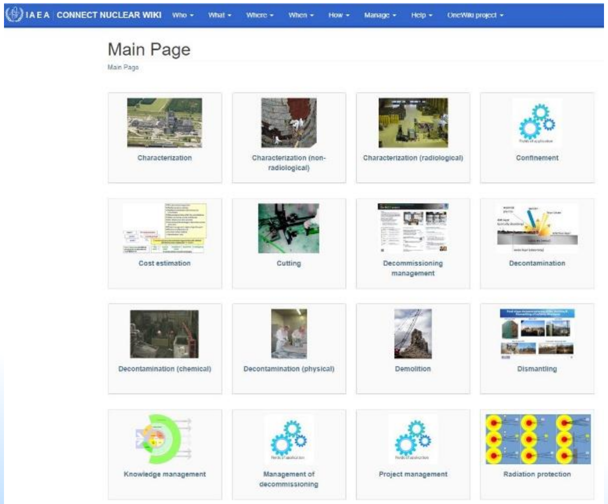
IAEA Support: E-learning for stakeholders and newcomers to the field

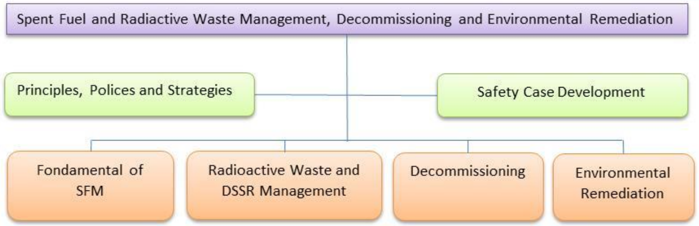
https://nucleus.iaea.org/sites/connect-members/LMS/Pages/Welcome-to-the-learning-materials-section.aspx

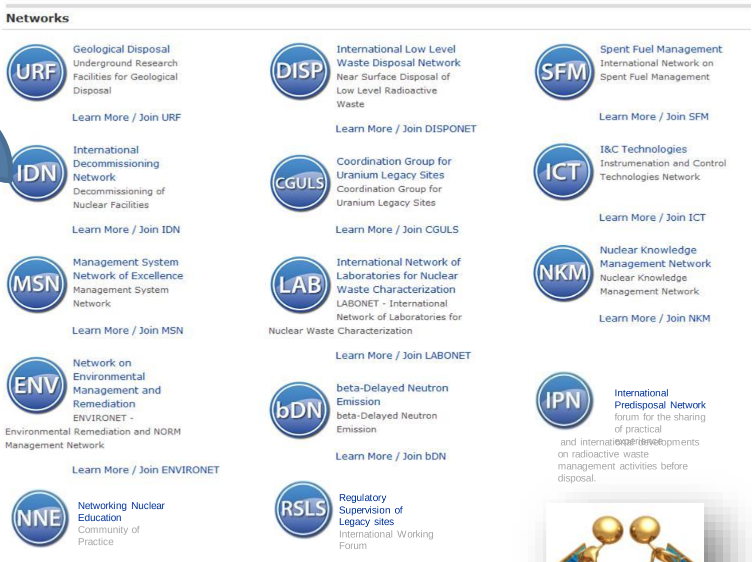
IAEA Support: Networks Web Based Tools to support information sharing

https://nucleus.iaea.org/sites/connect/Pages/default.aspx

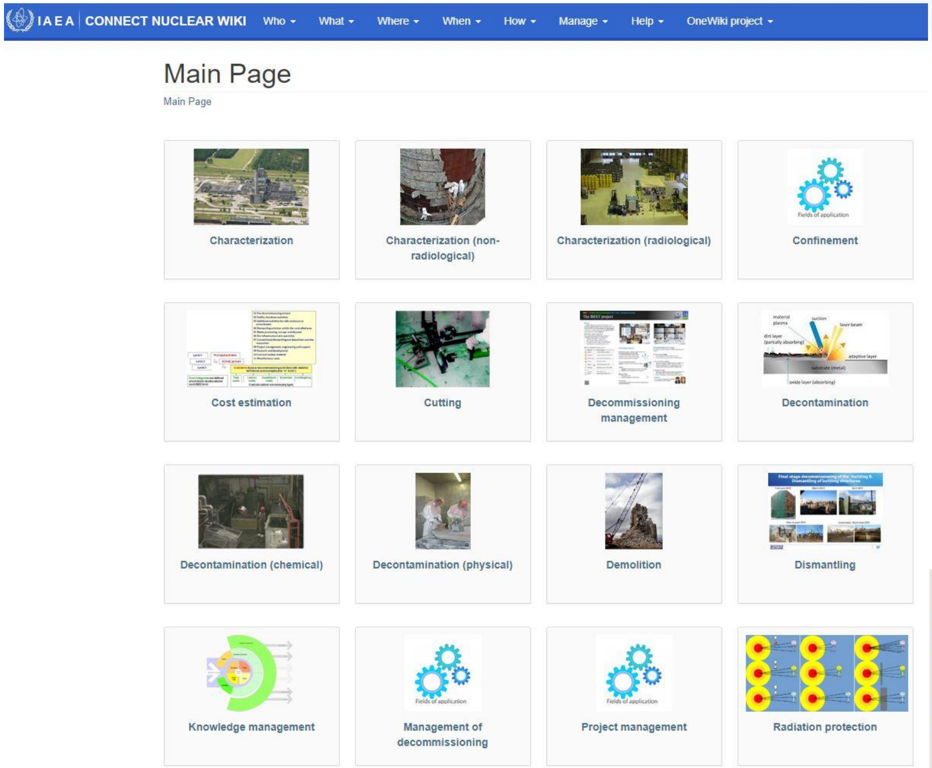
Launched in 2016 : WIKI

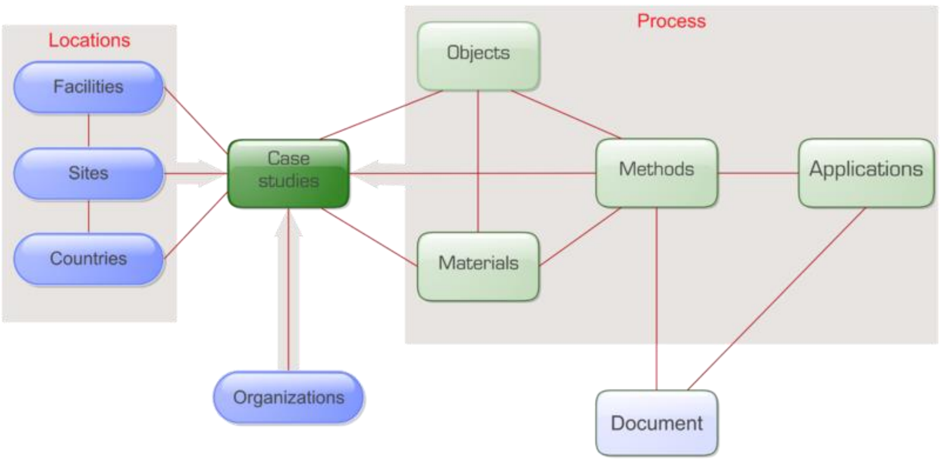






IAEA Nuclear Wiki





Not all connections shown

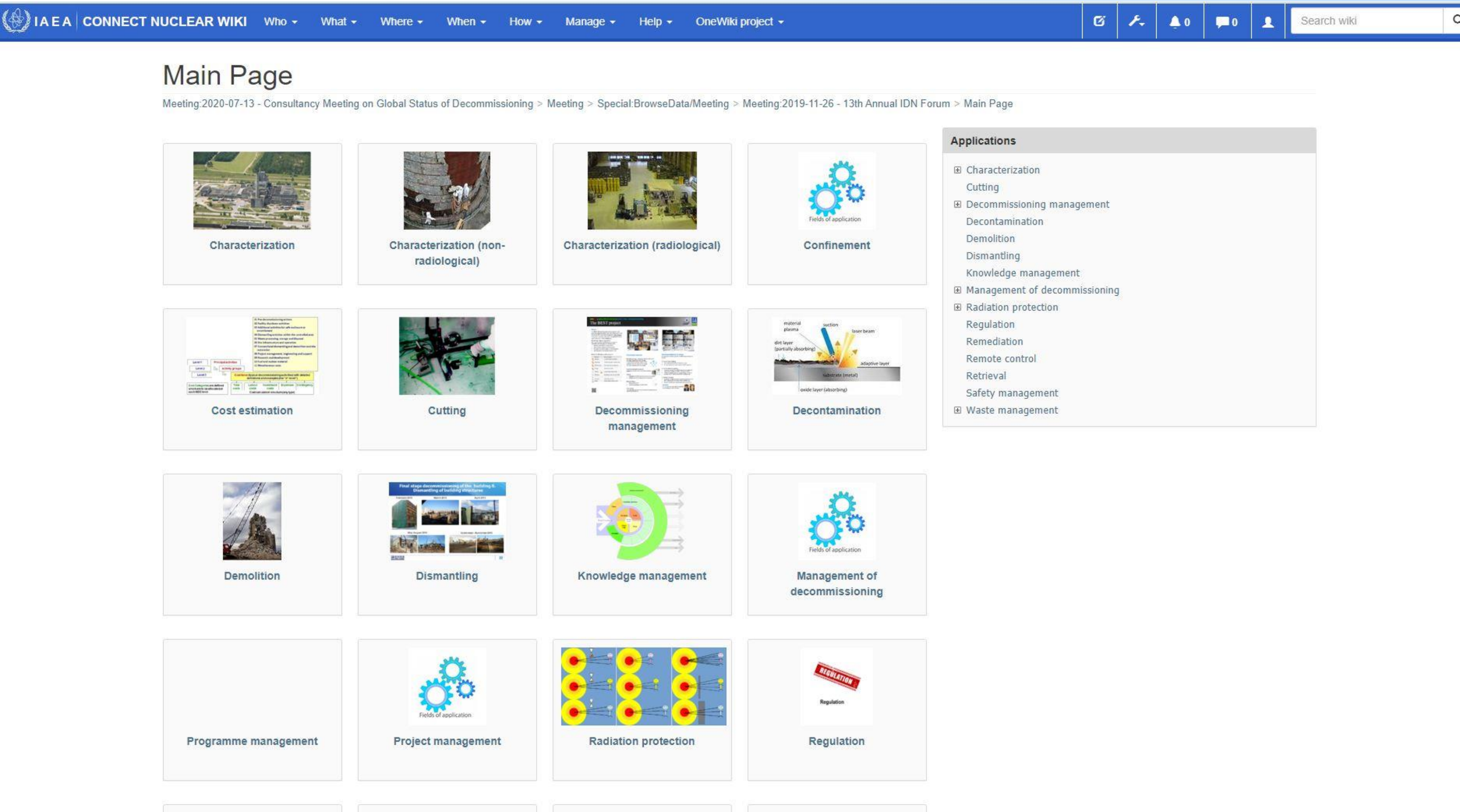
IAEA 60 Years

Atoms for Peace and Development

Thank you!

@IAEANE

www.iaea.org/nuclearenergy


IAEA CONNECT NUCLEAR WIKI
Who
What
Where
When
How
Manage
Help
OneWiki project
0
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Search wiki
Main Page
Meeting:2020-07-13 - Consultancy Meeting on Global Status of Decommissioning > Meeting > Special:BrowseData/Meeting > Meeting:2019-11-26 - 13th Annual IDN Forum > Main Page
Characterization
Characterization (non-radiological)
Characterization (radiological)
Confinement
Cost estimation
Cutting
Decommissioning management
Decontamination
Demolition
Dismantling
Knowledge management
Management of decommissioning
Programme management
Project management
Radiation protection
Regulation
Applications
Characterization
Cutting
Decommissioning management
Decontamination
Demolition
Dismantling
Knowledge management
Management of decommissioning
Radiation protection
Regulation
Remediation
Remote control
Retrieval
Safety management
Waste management

CONNECT NUCLEAR WIKI Who What Where When How Manage Help OneWiki project

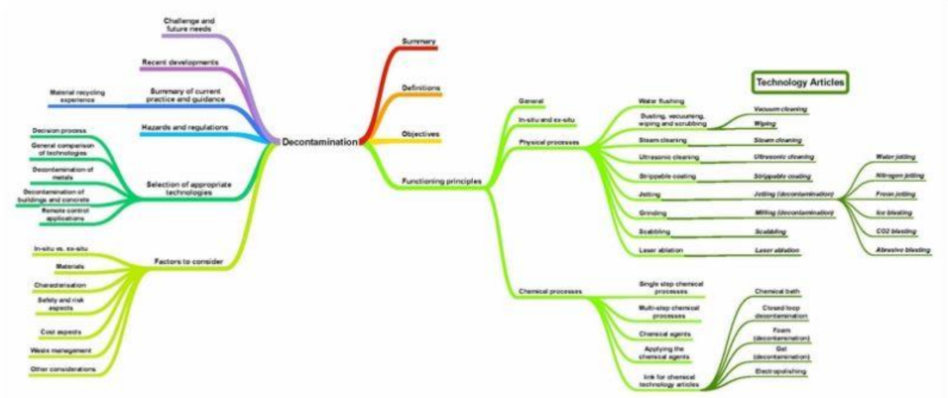
Decontamination

Meeting > Special:BrowseData/Meeting > Meeting:2019-11-26 - 13th Annual IDN Forum > Main Page > Decontamination

Decontamination is the complete or partial removal of contamination by a deliberate physical or chemical process.

Summary [edit | edit source]

This article provides an introduction to the decontamination of radioactively contaminated facilities, components and equipment, including guidance on associated decision making processes. Technical aspects are covered in a broad manner, including both physical and chemical decontamination techniques. More detailed information about specific decontamination technologies are provided in the associated technology articles. The map below illustrates the content structure and related technology articles.



Decontamination mindmap

Certain components may be subject to neutron activation as well as contamination by radioactive substances. In these cases, the additional radiological effects of isotopes generated by activation need to be considered before deciding on whether, and if so how, to proceed with decontamination. Decontamination will not address these activation effects.

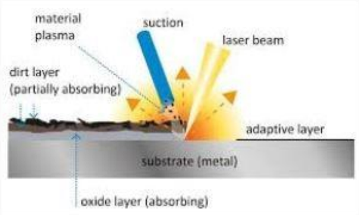
Soil decontamination techniques are not covered in this article, since they are covered under site remediation. In particular the application of biological decontamination technologies, which are generally applicable to soil decontamination (and to very special applications) are not discussed here; albeit these are included in the IAEA Glossary about decontamination (see below).

Decontamination of radioactively contaminated persons is not addressed in this article, albeit this is included in the broad IAEA definition of decontamination.

This article focuses on the most common decontamination needs. However, It is evident that, in case of severe accidents, in particular those involving partial or total nuclear fuel melt, extraordinary decontamination measures are needed, typically requiring the development of ad-hoc techniques outwith the scope of this article.

Definitions [edit | edit source]

Main Image



Laser decontamination technology

Application

Applications

- Characterization
- Cutting
- Decommissioning management
- Decontamination
- Demolition
- Dismantling
- Knowledge management
- Management of decommissioning
- Radiation protection
- Regulation
- Remediation
- Remote control
- Retrieval
- Safety management
- Waste management

Applied Technologies

- Biological decontamination

Dox-Decon....jpg

Jetting (decontamination)

Meeting:2019-11-26 - 13th Annual IDN Forum > Main Page > Decontamination > File:Decontamination Mindmap v1.0.pdf > Jetting (decontamination)

"Blasting" redirects here

See also: Jetting (cutting)

Jetting forces a liquid or gas out of a small opening under high pressure to create a high velocity stream capable of abrading surfaces and removing contamination. If abrasive particles are added into the fluid stream this is typically known as blasting (not to be confused with explosives blasting).

Functioning principles [edit | edit source]

Generic principles [edit | edit source]

Jetting forces a liquid or gas out of a small opening under high pressure to create a high velocity stream capable of abrading surfaces and removing contamination. If abrasive particles are added into the steam, this is also known as blasting (not to be confused with explosives blasting). Both jetting and blasting are common industrial cleaning techniques and a range of equipment is widely available. Some of the high pressure applications of the technology are capable of very high decontamination factors.

Jetting (without abrasives) will always use a liquid rather than a gas to give the fluid jet enough energy to abrade the surface. The liquid is typically water although it can be a liquefied gas, such as the case with nitrogen and freon; the latter two technology variants are more specialised techniques with fewer commercial vendors but they do have specific advantages (and disadvantages) as noted below.

Jetting with abrasives is commonly called blasting and uses abrasives of different types, projected at high speed by the carrier fluid against the surface to be treated. A liquid or gas carrier fluid can be used; if using a liquid the process is typically called wet blasting and with a gas (normally air) then it is known as dry blasting. Whether using wet or dry blasting equipment, it is important that the abrasive be recycled, otherwise secondary waste management quickly becomes a significant problem. Accordingly, abrasive blasting units that do not recycle should avoided or be considered for all but the most minor or specialised decontamination tasks.

The liquid jet or abrasive media impacts the surface to be decontaminated at a high velocity so care must be taken to avoid the 'hammering' effect, where contamination is actually pushed more deeply into the surface; this is especially true of surfaces with a degree of porosity. In addition, the high pressure applications of the technology are very aggressive and can quickly remove significant layers of concrete; however, the risk is that they can also wear away much more surface than planned (or required) if left running at a specific location for too long.

Water jetting principles [edit | edit source]

High pressure and ultra high pressure (HP and UHP) water processes use a pressurized water jet to remove contamination from a surface by the force of the jet. Pressures can range from 10^5 Pa to more than 10^8 Pa; the pressures and flow rates being optimized for individual requirements. Recirculation and treatment systems can also be used to minimize secondary waste production.

High pressure water processes use a pressurized water jet to remove contamination from the surface of the workpiece, the contamination being removed by the force of the jet. Pressures can range from around 100 bar for small domestic units to over 4000 bar for large industrial UHP cleaners; the pressures and flow rates need to be optimized for the specific requirements. Recirculation and treatment systems can also be used to minimize secondary waste production. The technique can also be used underwater as illustrated by figure 3 below which shows structural steel being decontaminated under water with a

Fig. 1 - Picture from WOMA Karcher Group - check

Main Image

Technology

Applied For Application	Decontamination
Applied To Object	Surface; Decommissioning objects
Applied To Material	Concrete; Metal; Plastic; Contaminatio

Case Studies

- Airborne contamination exposure
- Decontamination and rearranging of reactor canal and spent f at Garigliano NPP
- Fluidizable waste retrieval (France)
- Fluidizable waste retrieval (UK)
- Fluidizable waste retrieval (UK-2)
- Fluidizable waste retrieval (USA)
- Fluidizable waste retrieval (USA-10)
- Fluidizable waste retrieval (USA-2)
- Fluidizable waste retrieval (USA-3)
- Fluidizable waste retrieval (USA-4)
- Fluidizable waste retrieval (USA-5)
- Fluidizable waste retrieval (USA-6)
- Fluidizable waste retrieval (USA-7)
- Fluidizable waste retrieval (USA-8)
- Fluidizable waste retrieval (USA-9)
- Pool decommissioning
- Pool decommissioning 2

....jpg ...

Decontamination and rearranging of reactor canal and spent fuel pool at Garigliano NPP

Main Page > Decontamination > File:Decontamination Mindmap v1.0.pdf > Jetting (decontamination) > Decontamination and rearranging of reactor canal and spent fuel pool at Garigliano NPP

Work plan [edit | edit source]

Garigliano NPP was a 506 MW(th), first–generation, dual–cycle BWR. It started operation in 1964 and finally shut down in 1978, following the discovery of serious damage to a secondary steam generator. This annex describes decontamination activities carried out in 1991–1993 in preparation to safe enclosure of Garigliano NPP reactor building . Activities were carried out after completion of spent fuel transport off–site (1985–1987). A schematic of spent fuel pool and adjacent areas is given in Figure I–8.

Decontamination activities included the following:

1. Agitation and re–suspension of pool sediments through water jets and water filtration;
2. Lowering of water level and parallel decontamination of pool walls with high pressure water jets ca. 700 kg.cm–2;
3. Removal, decontamination and interim storage on gangways of equipment located on pool south–east wall;
4. Removal, decontamination and storage of the fuel transport container platform;
5. Removal of 4 fuel racks to their pool wall bearings, decontamination and transfer to the fresh fuel room;
6. Decontamination of vessel head platform, removal from reactor canal, brushing and coating to allow preservation and fixing of loose contamination. Eventually this component was placed back in the reactor canal;
7. Construction in the reactor canal of an interim structure supporting fuel racks. At the completion of the works this structure was dismounted, decontaminated and removed;
8. Removal of fuel racks (5 at a time) to their pool wall bearings, decontamination and interim storage in the reactor canal;
9. Gradual lowering of pool water level to some 50 cm from pool floor and parallel decontamination of fixed structures and walls;
10. Discovery by visual inspection and radiological checks, of activated components on the floor of the pool (Table I–1). Retrieval of all this material, segmentation as needed, temporary storage in containers, and later transfer to the high–activity store on–site;
11. Removal of sludge and crud from the pool floor and final decontamination. This material had a thickness of a few cm. This removal was effected with a combination of:
12. :* vacuum cleaner;
13. :* Centrifugal pumps following agitation with water jets;
14. :* Manual tools.

All liquids and sludge were transferred to the NPP radwaste system (Table I–2, Table I–3). It should be noted that the decontamination workers were all reactor staff (from various sections: Operations, Maintenance, and Health Physics). It should be also noted that the objective of the project was to minimize loose contamination, not necessarily fixed contamination. The ultimate aim was to reach radiological levels (e.g. airborne contamination) that keep access safe during the long safe enclosure period.

Radiation monitoring [edit | edit source]

Main Image

Case Study

Uses Technology	Jetting (decontamination); Sludge retrieval
Refers To Application	Decontamination; Cutting; Radiation protection
Involves Object	Garigliano NPP
Involves Material	Contamination; Sludge
Starting Point	Planned shutdown

Contents

1 Work plan
2 Radiation monitoring
3 Protection of the workforce
4 Working times and occupational exposures

Meta

Created	2020-06-29 22:11:44 CEST
Last Modified	2020-11-26 14:17:03 CET by John day
Categories	Case Study
Maturity Level	7088

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Cutting

Decontamination > File:Decontamination Mindmap v1.0.pdf > Jetting (decontamination) > Decontamination and rearranging of reactor canal and spent fuel pool at Garigliano NPP > Cutting

See also: Disassembly, Segmentation and Dismantling

Cutting is an action to penetrate an object for the purpose of dividing it. In the context of nuclear decommissioning, this can be to: make part of the object loose to enable dismantling; or to split the object for segmentation in order to allow segregation or size reduction for further treatment, disposal or release.

EDITING NOTES

Field of Application project page and status to be found under Cutting project page.

Definitions [edit | edit source]

(all 2nd draft)

Cutting is to penetrate an object/component for the purpose of dividing it in order to: make part of it loose to enable dismantling; to split the object for segmentation in order to allow segregation or size reduction.

Distinction from disassembly [edit | edit source]

Disassembly means taking apart SSCs at joints and features that have been used for assembly, it is the reverse process of assembling. Disassembly has to be distinguished from Cutting, which is using technologies that have not been used for assembly.

Distinction from decontamination [edit | edit source]

Decontamination of solids is the action of removing a surface layer, resulting in one workpiece and the removed material. Cutting results in two or more separate parts.

Distinction from bulk material decomposition [edit | edit source]

Decomposition of material by non-focussed forces such as breakers or crushers (or wrecking ball in case of demolition) can not be understood as cutting as the result is a size distributed bulk material and not pieces of predefined geometries. Application of decomposition without additional protection is only feasible if the material is appropriately free of contamination (radiological or non-radiological).

Objectives of Cutting [edit | edit source]

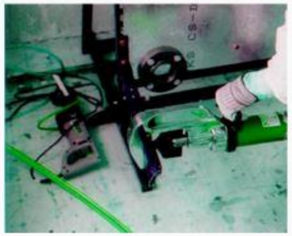
Cutting is used to change the geometry of an object for the purpose of dismantling or waste management (e.g. for segregation, size reduction, or to expose hidden surfaces for treatment such as decontamination). The objectives for cutting any item must be identified in advance in line with the overall goals for the decommissioning project and in line with the waste management plan.

When dismantling or segmenting, cutting may be used and an alternative to disassembly where it is:

- not physically possible to disassemble e.g. the facility construction prohibits access to disassembly features;
- quicker to cut than disassemble e.g. some cutting technologies especially for piping, etc. can be quicker than undoing flange bolts, etc. and speed of disassembly may be important such as in high radiation fields;
- the features for disassembly no longer function, e.g. bolts or pins have become rusted or parts have become fused together through rust or wear.

The objectives of cutting for disassembly are fairly obvious; it helps remove an item from the facility either by breaking it free from surrounding structures or size reducing it to allow the material to come out though apertures or designated routes. However, the objectives of cutting when supporting waste

Main Image



Application

Applications

- ⊞ Characterization
- Cutting
- ⊞ Decommissioning management
- Decontamination
- Demolition
- Dismantling
- Knowledge management
- ⊞ Management of decommissioning
- ⊞ Radiation protection
- Regulation
- Remediation
- Remote control
- Retrieval
- Safety management
- ⊞ Waste management

Applied Technologies

- Abrasive cutting
- Consumable electrode cutting

Abrasive cutting

Decontamination and rearranging of reactor canal and spent fuel pool at Garigliano NPP > Cutting > Cutting project page > Laser cutting > Abrasive cutting

See also : *Wire saw*

Functioning principles [edit | edit source]

Abrasive cutting tools are electrically, hydraulically or pneumatically powered wheels, chain links or corers containing abrasive elements held in a semi-rigid supporting matrix. Typical abrasives used include aluminium oxide, silicon carbide or diamond and these cut the workpiece by local shearing at multiple cutting points. Abrasive cutters can be used either dry or with a coolant, such as water, which is often recirculated to reduce secondary material volumes. The technique is used extensively worldwide and in a wide range of industries. At least 100 years of experience and development has taken place to establish this branch of cutting.

Note that while grinding uses similar tools and technology, the aim of grinding is to remove a surface layer for decontamination of a component rather than the cutting of a component.

Abrasive Water Jet cutting, using a high-pressure water jet with abrasive, has different applications and issues to consider and as such is is covered under a separate article.

Applicability [edit | edit source]

Carbides and aluminium oxide [edit | edit source]

Carbides and aluminium oxide abrasive materials are supported by a binding material in the form of a circular disc and will cut metal, brick, or concrete with, or without, embedded reinforcing bars. Deployment systems for most applications are commercially available and are well developed. Examples of where such tools have been used is contained within refs 1 & 2.

Diamond [edit | edit source]

Diamond abrasives are embedded in cutting wheels and coring tools, and also in the chain links of diamond chainsaws. Typical applications are shown in Figures 1-2.

Diamond blades or wall saws are widely used during civil deconstruction work for cutting concrete and reinforced concrete and were used to dismantle the biological shield at JPDR. These blades have now been developed for cutting without coolant and for the cutting of pure metal structures.

Diamond corers have a similar construction to that of circular diamond saw blades, except that they are cylindrical in shape. Like circular blades, they can be used to cut concrete or steel structures with or without coolant. Corers have been used fro example at HDR for concrete removal. They are commonly used for drilling holes, for stitch drilling operations where the material is cut by cutting multiple cores in a line or for removing samples of material.

A more recent development is the use of diamond chainsaws. These can be used for cutting both concrete and reinforced concrete. Such tools have recently been used during the decommissioning of the VVR-S Research Reactor in Romania - Ref. 3.

Main Image

Technology

Applied For Application	Cutting
Applied To Object	Civil structure
Applied To Material	Concrete; Steel

Case Studies

- Active process line accidentaly cut
- Brachytherapy facility decommissioning (Cuba)
- Graphite containing canisters fragmentation
- Spent fuel reprocessing facility dismantling La Hague
- Technologies for decommissioning 2
- Waste management facility

Contents

1 Functioning principles
2 Applicability
2.1 Carbides and aluminium oxide
2.2 Diamond
3 Advantages and disadvantages
4 Protective measures
5 References

The European Commission's science and knowledge service

Joint Research Centre

education and training in nuclear decommissioning

EC-JRC

Euratom Coordination unit

SHARE on-line Workshop

2 December 2020

lessons from the ROUNDTABLES organised by the EC on nuclear decommissioning in the EU

Currently, industrial experience exists, progresses are made, particularly with the decommissioning of reactors,

… however **further attention is necessary for:**

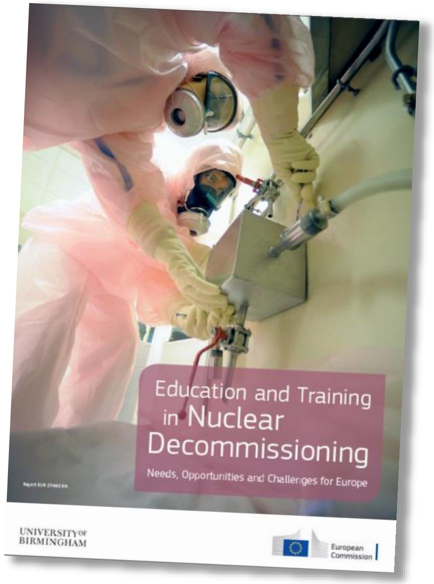
- ✓ development of the most suitable techniques, with respect to safety, efficiency and waste limitation;
- ✓ standardisation and harmonisation (incl. cost estimation);
- ✓ offering and promoting dedicated education and training opportunities;
- ✓ sharing knowledge and experiences.

European
Commission

education and training in decommissioning

JRC organised jointly with the University of Birmingham in 2015 a seminar on Education and Training in Nuclear Decommissioning, in an attempt to answer to the questions:

- **What are the E&T needs ?**
- **What are the opportunities, what does already exist ?**
- **How can we attract young talent ?**



➢ Outcome of the seminar is published in a joint report with orientations on the way forward to support Education and Training in Nuclear Decommissioning in the EU.

https://ec.europa.eu/jrc/en/publication/education-and-training-nuclear-decommissioning-needs-opportunities-and-challenges-europe

How can we stimulate interest and future talent?

The JOB…

- 'Breaking down' is not a very attractive occupation for me, I would prefer building something new!
- Why do I need to take care of the negative 'nuclear heritage' left by the others?
- At the end.. there is 'nothing'.
  What will then happen with my job?

How can we stimulate interest and future talent?

The JOB…

- Decommissioning is in reality **much more** than clearing, cleaning and demolishing; decommissioning projects usually present an appealing technological challenge, requiring creative solutions.

- Decommissioning is an emerging activity involving on the average young people; related jobs offer many possibilities for **career development**.

- Decommissioning offers also tremendous opportunities for people who have developed expertise in reliable technologies or experience in managing projects and who are interested in **mobility**.

- A job in decommissioning is, in general, **secure**; young engineers and scientists graduating after studies dedicated to decommissioning are almost certain to find a job.

- Actually, decommissioning provides a service to society and can be considered as a **'noble cause'**: decommissioning is aiming to restore a safe environment and demonstrates that closing the nuclear energy cycle is feasible.

ELINDER

European Learning Initiatives for
Nuclear Decommissioning and Environmental Remediation

purpose of the ELINDER project:

Stimulate vocational training in nuclear decommissioning in the EU, by:

- creating a European 'pool of training initiatives' offering at different locations a series of courses, visits and practical studies;
- organised in complementing modules, reducing duplication;
- harmonizing and clarifying the learning outcomes;
- offering an EU 'quality label' to those initiatives contributing to competence building in decommissioning and waste management.

European Commission

ELINDER approach

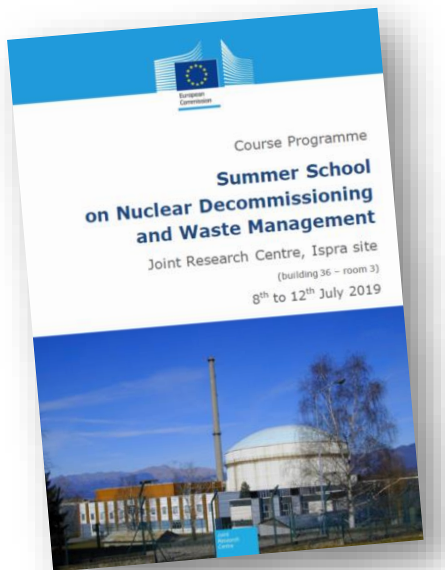
- Training modules of 1-2 weeks, at different locations
- Qualified **'Generic courses'** (G1-G5 General Introduction to Decommissioning) and **'Specific courses':**
  - S1 Decommissioning Planning and Cost Assessment
  - S2 Licensing and Environmental Impact Assessment
  - S3 Decommissioning Safety
  - S4 Decommissioning Programme and Project Management
  - S5 Waste and Material Management
  - S6 Decontamination and Dismantling Techniques
  - S7 Metrology for Waste Characterisation and Clearance
  - S8 Environmental Remediation and Site Release
  - S9 Digitalisation in decommissioning
- Complemented with **'e-Learning course'** (induction to nuclear)

European Commission

JRC's Decommissioning Summer School

- ELINDER Generic course G5 -

- held at **JRC-Ispra**, 9-13 July 2018 and 8-12 July 2019
- for **Master students** (with Bachelor degree, still studying) max. 40



- mixture of lectures, practical exercises and visit
- lecturers from EC, IAEA and from seven EU MS
- concluded with a test
- mini 'job fair' (meeting with industry)
- repeated every year – next planned for **6-10 July 2020**

European Commission

JRC's Decommissioning Summer School

- ELINDER Generic course G5 -

European Commission

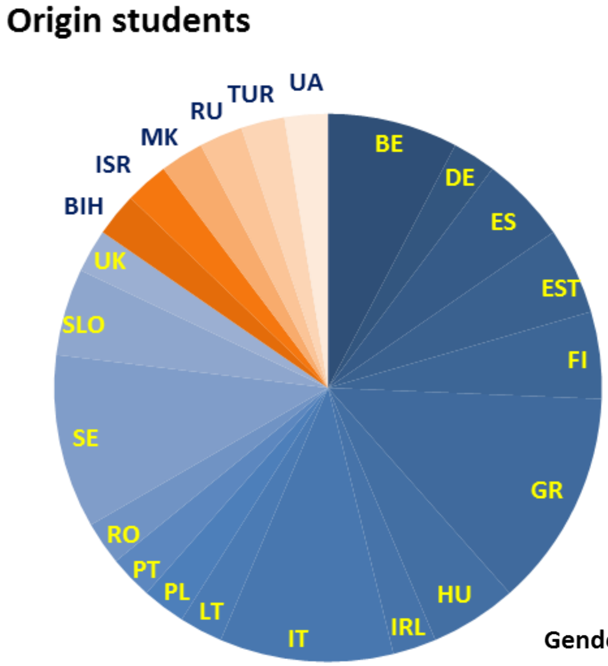
JRC's Decommissioning Summer School

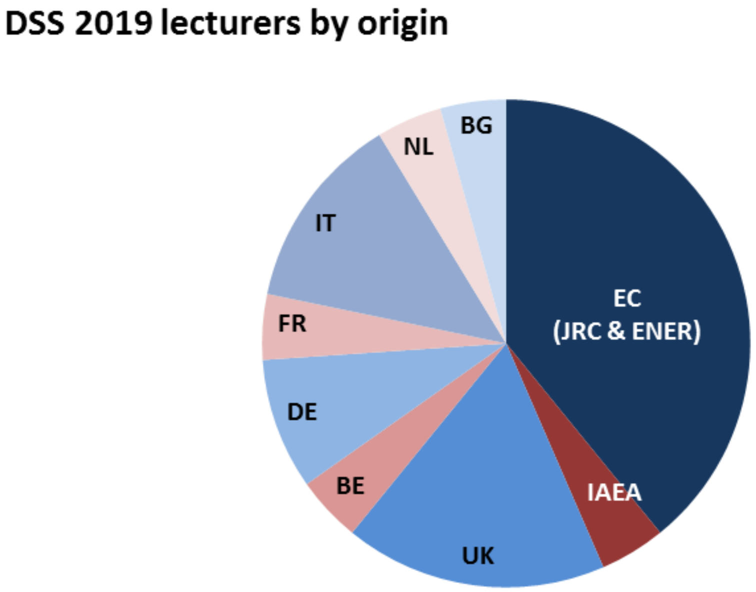
- ELINDER Generic course G5 -

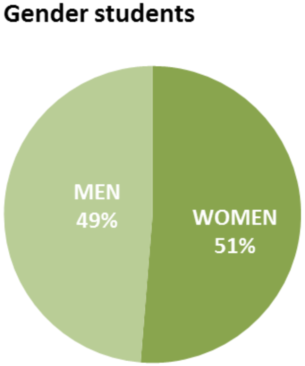
European Commission

JRC's Decommissioning Summer School

- ELINDER Generic course G5 -







Metrology for Waste Characterisation and Clearance

- ELINDER Specific course S7 -

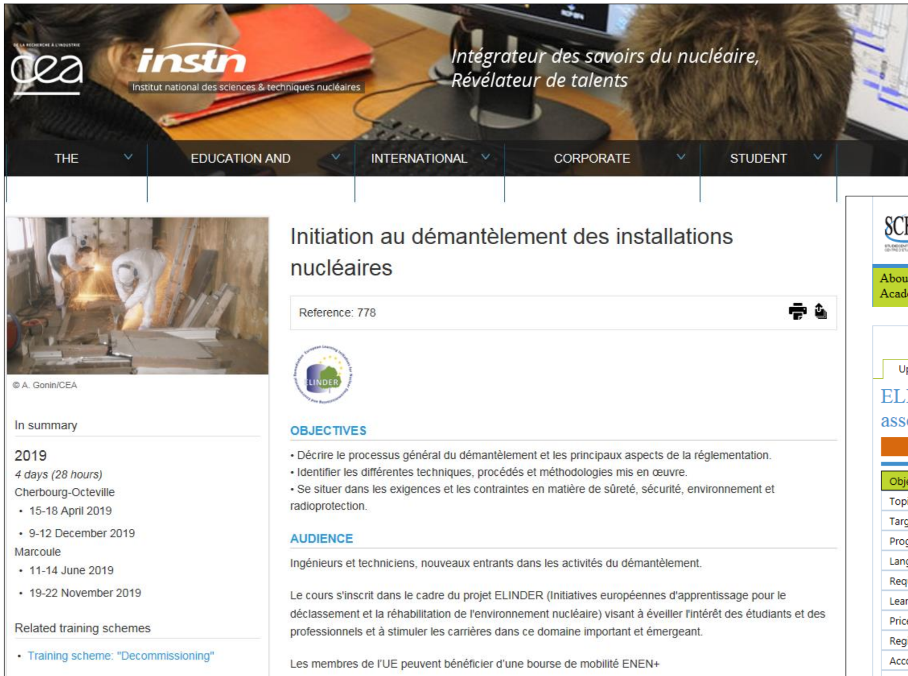
- held at **JRC-Ispra**, for the first time on 16-20 September 2019
- for **professionals** having already experience in nuclear field
- theory on metrology through lectures by experts

- focus on also **practical** demos and exercises with specific measurement systems:
    1. gamma spectrometry for waste measurement
    2. gamma spectrometry for clearance
    3. passive neutron counting
    4. destructive analysis
- concluded with a test
- repeated every year

European Commission

CEA-INSTN, F: ELINDER Generic course G3

SCK•CEN, B: ELINDER Specific course S2


instn
Institut national des sciences & techniques nucléaires
Intégrateur des savoirs du nucléaire, Révélateur de talents

THE | EDUCATION AND | INTERNATIONAL | CORPORATE | STUDENT

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In summary

2019
4 days (28 hours)
Cherbourg-Octeville
- 15-18 April 2019
- 9-12 December 2019

Marcoule
- 11-14 June 2019
- 19-22 November 2019

Related training schemes
- Training scheme: "Decommissioning"

Initiation au démantèlement des installations nucléaires

Reference: 778

OBJECTIVES

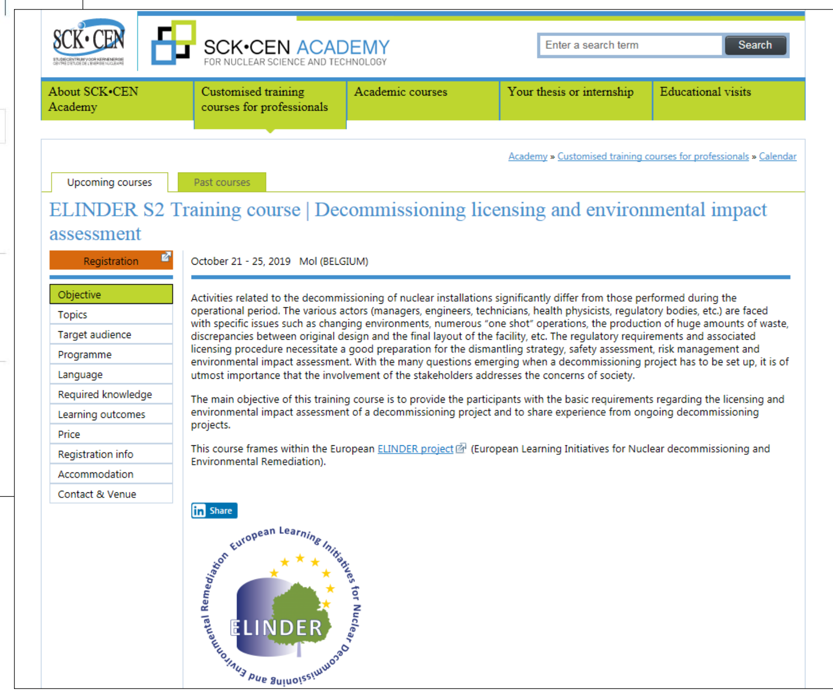
• Décrire le processus général du démantèlement et les principaux aspects de la réglementation.
• Identifier les différentes techniques, procédés et méthodologies mis en œuvre.
• Se situer dans les exigences et les contraintes en matière de sûreté, sécurité, environnement et radioprotection.

AUDIENCE

Ingénieurs et techniciens, nouveaux entrants dans les activités du démantèlement.

Le cours s'inscrit dans le cadre du projet ELINDER (Initiatives européennes d'apprentissage pour le déclassement et la réhabilitation de l'environnement nucléaire) visant à éveiller l'intérêt des étudiants et des professionnels et à stimuler les carrières dans ce domaine important et émergeant.

Les membres de l'UE peuvent bénéficier d'une bourse de mobilité ENEN+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FOR NUCLEAR SCIENCE AND TECHNOLOGY

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ELINDER S2 Training course | Decommissioning licensing and environmental impact assessment

Registration

October 21 - 25, 2019 Mol (BELGIUM)

- Objective
- Topics
- Target audience
- Programme
- Language
- Required knowledge
- Learning outcomes
- Price
- Registration info
- Accommodation
- Contact & Venue

Activities related to the decommissioning of nuclear installations significantly differ from those performed during the operational period. The various actors (managers, engineers, technicians, health physicists, regulatory bodies, etc.) are faced with specific issues such as changing environments, numerous "one shot" operations, the production of huge amounts of waste, discrepancies between original design and the final layout of the facility, etc. The regulatory requirements and associated licensing procedure necessitate a good preparation for the dismantling strategy, safety assessment, risk management and environmental impact assessment. With the many questions emerging when a decommissioning project has to be set up, it is of utmost importance that the involvement of the stakeholders addresses the concerns of society.

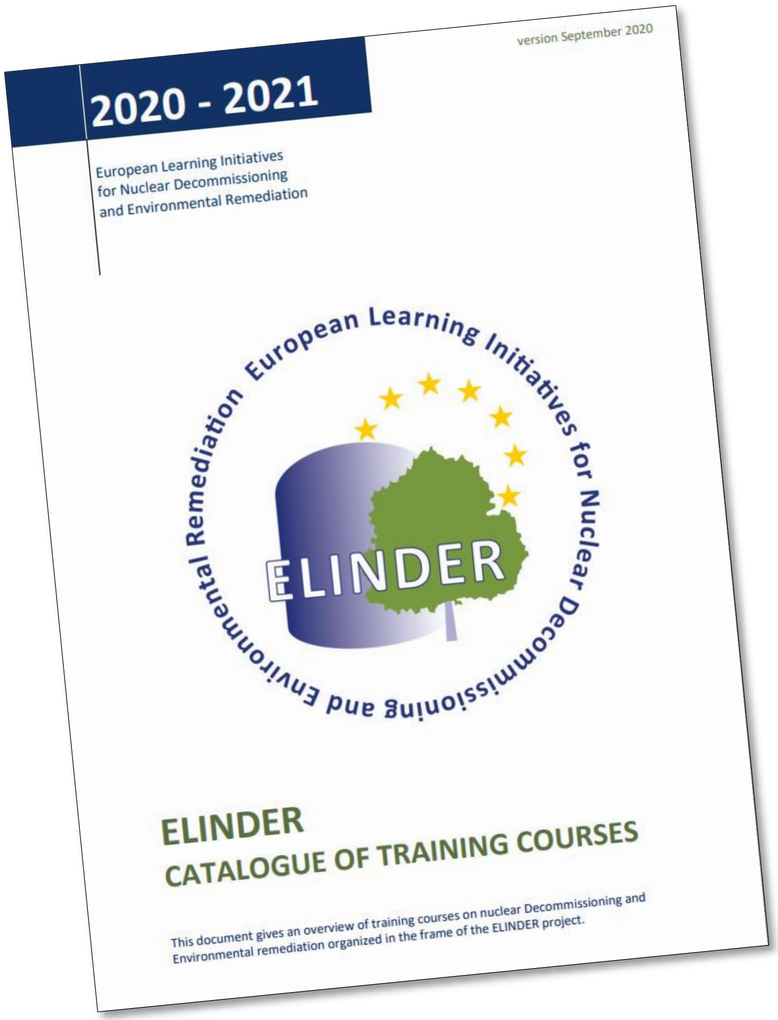
The main objective of this training course is to provide the participants with the basic requirements regarding the licensing and environmental impact assessment of a decommissioning project and to share experience from ongoing decommissioning projects.

This course frames within the European ELINDER project (European Learning Initiatives for Nuclear decommissioning and Environmental Remediation).

Share

European Commission

ELINDER project



Catalogue and info:

https://ec.europa.eu/jrc/en/training-programme/elinder

European Commission


thank you for
your attention
European Learning Initiatives for Nuclear Decommissioning and Environmental Remediation
ELINDER

The European Nuclear Education Network

Joerg Starflinger
President of the Board of Directors, ENEN AISBL

Professor and Director of the Institute of Nuclear Technology and Energy Systems (IKE), University of Stuttgart, Germany

Motivation

Nuclear power is a (very!) **long-term commitment**. Each unit may be with us for 100 years or more. Decommissioning might last one decade, or more.

Long-term sustainability of nuclear power calls for the **long-term use** of the **best available people**, science, knowledge, technologies and operational experience in a **rapidly changing world**.

ENEN - International Non-Profit Association

- The European Nuclear Education Network, **ENEN AISBL**, is an international non-profit association established under the Belgian law in 2018
- Successor organization of **ENEN** established under French law in 2003.

ENEN General Assembly at Foundation Universitaire, Brussels, Belgium, March 6th, 2020, Photo: Ján Haščík

ENEN Mission

The main objective of ENEN is the **preservation** and further **development** of expertise in the nuclear fields by higher Education & Training:

- Promote and further develop the **collaboration** in nuclear education, and training of students, researchers and professionals
- Ensure the **quality** of nuclear education and training
- Increase the **attractiveness** for engagement in the nuclear fields for students, researchers and professionals
- Promote **life-long learning** and career development at post-graduate or equivalent level

ENEN Members in 2020

79 Members from 25 Countries

Research Centers, Companies, Universities, TSOs and International Institutions

IAEA

EUROPEAN NUCLEAR SOCIETY

NEA Nuclear Energy Agency

WORLD NUCLEAR UNIVERSITY

FUSENET The European Fusion Education Network

WFSJ World Federation of Science Journalists

ENEN Activities

- **ENEN-original activities**
  - For students at Master Level: EMSNE: European MSc in Nuclear Engineering
  - For students at Ph.D. Level: Annual ENEN PhD Event & Prize
  - Co-organisation of NESTet 2021 conference (together with ENS)
  - Global networking
  - Facilitating discussion / activities between member institutions

- **Activities executed by ENEN**
  - Coordination of and participation in EU-projects, actually most of them financed by EU
  - Organization of Education and Training courses
  - Dissemination and Communication activities
  - Support of mobility of students

  Within projects, R&D is carried out by ENEN members, not ENEN itself.

EMSNE European MSc in Nuclear Engineering

- Requirements
  - At least 5 years university education (3+2, 4+1, or 5).
  - Master thesis
  - At least 60 ECTS must be "purely nuclear"
  - 20 ECTS must be obtained from a "foreign" institution, member of the ENEN Association
- List of topics considered "purely nuclear":
  - Reactor engineering, Reactor physics
  - Nuclear thermal hydraulics
  - Safety and reliability of nuclear facilities
  - Reactor engineering materials
  - Radiology and radiation protection
  - Nuclear fuel cycle and applied radiochemistry

Some thoughts about Decommissioning (1/3)

- The topic „decommissioning“ is not very attractive for students
- My personal experience:

Student voice: „If I decommissioned the plant, I decommissioned my job.“

- Students like to participate in **innovation and creation processes**, like for SMR, for GEN IV, for nuclear reactors to be built on moon …

- Do we have the right messages and do we tell the message correctly?

Some thoughts about Decommissioning (2/3)

- The topic „decommissioning“ benefits from strong interaction between education & training.

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Education

Training

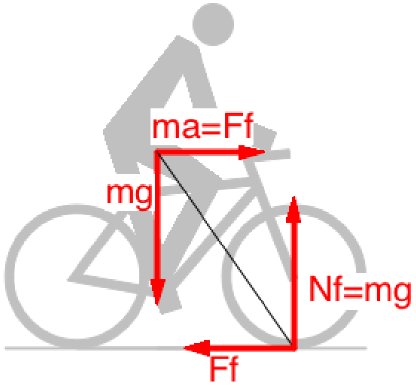
Academia

Get Knowledge

By means of Research

Driven by Curiosity

Problem oriented



Industry, Regulators

Get Skills

By means of Experience

Driven by Need

Solution oriented

Some thoughts about Decommissioning (3/3)

- Transparency issue?
  - Because of ongoing work, NDAs are mandatory for collaboration of industry and academia.
  - How does the “need” find the way into the academic work?
  - How do new developments from “research” (e.g. augmented reality) find its way into industry?
  - Interaction and networking between all stakeholders is mandatory for continuously attract students to this field.

- New Master courses / Master program?
  - Master courses with strong involvement of industry, including internships for practical training of students
  - Courses should also in Management of Nuclear Projects
  - Danger: Nuclear field should not be fragmented! Otherwise, “isolated nuclear clubs” are created

Summary

- Long-term sustainability of nuclear power calls for the **long-term use** of the **best available people**, science, knowledge, technologies and operational experience.
- Nuclear energy is a very long-term commitment (>100 years).
- New processes are under development or being exploited, also true in decommissioning.
- **Networking in nuclear** is extremely fruitful for the benefit of both academia and industry

- ENEN is open for collaboration and networking

Thank you for your attention

www.enen.eu

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